

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended). An air-fuel ratio sensor comprising:
a cylindrical housing having a first end and an opposite second end;
an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;
an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and
a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured,

wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the measured gas side cover, and a bottom hole formed in a bottom wall thereof,

wherein the gas inlet hole of an innermost one of the plurality of cover members that directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor, ~~and~~

wherein the cylindrical housing has an end face facing the inside chamber of the measured gas side cover at the second end of the housing, the detecting portion of the air-fuel ratio sensor element is spaced from the end face of the housing by a first distance in the axial direction of the sensor, and the gas inlet hole of the innermost cover member has a center located at a position spaced from the end face of the housing in the axial direction of the sensor by a second distance smaller than one-half of the first distance, and

wherein the sensor is disposed in an exhaust manifold of a diesel engine for performing measurement of an air-fuel ratio in an exhaust gas containing a combustible gas added to on an exhaust side of the diesel engine.

Claim 2. (Canceled).

3. (Original) The air-fuel ratio sensor according to claim 1, wherein the total area of the gas inlet hole of each cover member has a minimum value in the range of 0.3 to 12 mm².

4. (Original) The air-fuel ratio sensor according to claim 1, wherein the total area of the bottom hole of each cover member has a minimum value in the range of 0.3 to 12 mm².

5. (Original) The air-fuel ratio sensor according to claim 1, further comprising a partition structure for blocking flow communication of the measured gas between the gas inlet hole of each cover member and the bottom hole of each cover member.

6. (Previously presented) The air-fuel ratio sensor according to claim 5, wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a partition plate hermetically fitted in the explosionproof cover member and adjacent to the bottom wall of the explosionproof cover member.

7. (Original) The air-fuel ratio sensor according to claim 6, wherein the partition plate has an outer peripheral portion extending obliquely from the bottom wall of the outer cover member toward the bottom wall of the explosionproof cover member.

8. (Original) The air-fuel ratio sensor according to claim 5, wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a ring-shaped partition plate hermetically fitted in an annular space defined between the explosionproof cover member and the outer cover member and located adjacent to the bottom wall of the outer cover member.

9. (Original) The air-fuel ratio sensor according to claim 5, wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a truncated hollow cone hermetically fitted in an annular space defined between the explosionproof cover member and the outer cover member and having a small diameter end engaged with a side wall the outer cover adjacent to the bottom wall of the outer cover member and an large diameter end engaged with a side wall of the explosionproof cover member adjacent to the bottom wall of the explosionproof cover member.

10. (Original) The air-fuel ratio sensor according to claim 5, wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a part of a side wall of the explosionproof cover member being constricted in a radial inward direction so such that the constricted part of the side wall is in close contact with the bottom wall of the outer cover member.

11. (Original) The air-fuel ratio sensor according to claim 5, wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof held in close contact with the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner, outer and explosionproof cover members held in close contact with each other.

12. (Original) The air-fuel ratio sensor according to claim 1, wherein the plurality of cover members include an outer cover member disposed immediately outside the innermost cover member, and the gas inlet hole of the outer cover member is offset from the air-fuel ratio detecting portion of the sensor element in a direction away from the housing.

13. (Original) The air-fuel ratio sensor according to claim 1, wherein the air-fuel ratio sensor element comprises a cup-shaped sensor element or a laminated type sensor element.

14. (Original) The air-fuel ratio sensor according to claim 1, wherein the air-fuel ratio sensor element comprising a laminated type sensor element, and the plurality of cover members of the measured gas side cover each have a quadrangular shape in cross section.

15. (Currently amended) ~~The~~ An air-fuel ratio sensor ~~according to claim 1,~~
comprising:

a cylindrical housing having a first end and an opposite second end;

an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;

an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and

a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured,

wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the measured gas side cover, and a bottom hole formed in a bottom wall thereof,

wherein the gas inlet hole of an innermost one of the plurality of cover members that directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor,

wherein the cylindrical housing has an end face facing the inside chamber of the measured gas side cover at the second end of the housing, the detecting portion of the air-fuel ratio sensor element is spaced from the end face of the housing by a first distance in the axial direction of the sensor, and the gas inlet hole of the innermost

cover member has a center located at a position spaced from the end face of the housing in the axial direction of the sensor by a second distance smaller than one-half of the first distance, and

wherein the sensor is disposed in a surge tank for performing measurement of an air-fuel ratio in an evaporated gas.

Claims 16-36 (Canceled).

37. (Previously presented) An air-fuel ratio sensor comprising:
a cylindrical housing having a first end and an opposite second end;
an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;
an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and
a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured, wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the measured gas side cover, and a bottom hole formed in a bottom wall thereof, and wherein the gas inlet hole of an innermost one of the plurality of cover members that directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor, and
a partition structure for blocking flow communication of the measured gas between the gas inlet hole of each cover member and the bottom hole of each cover member,

wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a partition plate hermetically fitted in the explosionproof cover member and adjacent to the bottom wall of the explosionproof cover member.

38. (Previously presented) The air-fuel ratio sensor according to claim 37, wherein the partition plate has an outer peripheral portion extending obliquely from the bottom wall of the outer cover member toward the bottom wall of the explosionproof cover member.

39. (Previously presented) An air-fuel ratio sensor comprising:
a cylindrical housing having a first end and an opposite second end;
an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;
an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and
a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured, wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the measured gas side cover, and a bottom hole formed in a bottom wall thereof, and wherein the gas inlet hole of an innermost one of the plurality of cover members that

directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor, and

a partition structure for blocking flow communication of the measured gas between the gas inlet hole of each cover member and the bottom hole of each cover member,

wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a ring-shaped partition plate hermetically fitted in an annular space defined between the explosionproof cover member and the outer cover member and located adjacent to the bottom wall of the outer cover member.

40. (Previously presented) An air-fuel ratio sensor comprising:
a cylindrical housing having a first end and an opposite second end;
an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;
an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and
a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured, wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the

measured gas side cover, and a bottom hole formed in a bottom wall thereof, and wherein the gas inlet hole of an innermost one of the plurality of cover members that directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor, and

a partition structure for blocking flow communication of the measured gas between the gas inlet hole of each cover member and the bottom hole of each cover member,

wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a truncated hollow cone hermetically fitted in an annular space defined between the explosionproof cover member and the outer cover member and having a small diameter end engaged with a side wall the outer cover adjacent to the bottom wall of the outer cover member and a large diameter end engaged with a side wall of the explosionproof cover member adjacent to the bottom wall of the explosionproof cover member.

41. (Previously presented) An air-fuel ratio sensor comprising:
a cylindrical housing having a first end and an opposite second end;
an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;
an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and

a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured, wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the measured gas side cover, and a bottom hole formed in a bottom wall thereof, and wherein the gas inlet hole of an innermost one of the plurality of cover members that directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor, and

a partition structure for blocking flow communication of the measured gas between the gas inlet hole of each cover member and the bottom hole of each cover member,

wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof separated from the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner and outer cover members held in close contact with each other, and a part of a side wall of the explosionproof cover member being constricted in a radial inward direction so such that the constricted part of the side wall is in close contact with the bottom wall of the outer cover member.

42. (Previously presented) An air-fuel ratio sensor comprising:
a cylindrical housing having a first end and an opposite second end;
an air-fuel ratio sensor element inserted through the cylindrical housing and capable of detecting an air-fuel ratio in an atmosphere of unburnt gas, the sensor element having a detecting portion for performing detection of the air-fuel ratio;

an atmospheric side cover disposed on the first end of the cylindrical housing and defining an inside chamber for storing therein atmospheric air; and

a measured gas side cover disposed on the second end of the cylindrical housing so as to cover the air-fuel ratio sensor element and defining an inside chamber for storing therein a gas to be measured, wherein the measured gas side cover has a nested structure composed of a plurality of cup-shaped cover members disposed one inside another, each of the cup-shaped cover members having a gas inlet hole formed in a side wall thereof for introducing the measured gas into the inside chamber of the measured gas side cover, and a bottom hole formed in a bottom wall thereof, and wherein the gas inlet hole of an innermost one of the plurality of cover members that directly faces the air-fuel ratio sensor element is offset from the detecting portion of the air-fuel ratio sensor element toward the housing in an axial direction of the air-fuel ratio sensor, and

a partition structure for blocking flow communication of the measured gas between the gas inlet hole of each cover member and the bottom hole of each cover member,

wherein the plurality of cover members of the measured gas side cover include an inner cover member forming the innermost cover member, an outer cover member disposed outside the inner cover member with a bottom wall thereof held in close contact with a bottom wall of the inner cover member, and an explosionproof cover disposed outside the outer cover member with a bottom wall thereof held in close contact with the bottom wall of the outer cover member, and the partition structure includes the bottom walls of the inner, outer and explosionproof cover members held in close contact with each other.